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**THE ROLE OF EXTENDED PRODUCER RESPONSIBILITY POLICIES IN PROMOTING CIRCULAR BUSINESS MODELS**

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*EPR policies are one of the vital components that push circular business model by making producers responsible for lifecycle of their products. This paper investigates the effect of EPR policies adopted for waste management and resource efficiency and shares benefits in terms of economy and environment. The paper stresses how EPR policy has dramatically increased recycling rates and resource recovery in various countries. In these findings, EPR was found as a vital driving tool for sustainable resource use and encouraging innovation in processes.*

**Keywords:** Extended Producer Responsibility (EPR), Plastic Waste Management Rules (PWMR), Central Pollution Control Board (CPCB), Producers, Importers, and Brand - owners (PIBOs), Plastic Waste Processors (PWPs), Circular Business Model (CBM)

**1. INTRODUCTION**

Due to the increasing environmental threats and limited availability of natural resources, a shift from the old linear economic model to a circular business model is urgently needed. The linear model characterized by 'take-make-dispose' has caused massive degradation of the environment, depletion of resources, and accumulation of waste. Circular business models, in contrast, focus on resource efficiency, minimizing waste, and establishing closed-loop systems that reuse, repair, and recycle products and materials. It is in this context that Extended Producer Responsibility (EPR) policies have emerged as important tools to stimulate the transition to circularity.

EPR was formally introduced to the world by Dr. Thomas Lindhquist as early as in the 1900s. He is currently affiliated with the Lund University and is a Senior lecturer at The International Institute for Industrial Environmental Economics. The EPR in India was promulgated under the e-waste (management and handling) rules, which came in 2011. This policy of the government made producers responsible for the collection and recycling of electronic waste. Extension of EPR, later, with respect to plastic waste management took place with the implementation of the Plastic Waste Management Rules in 2016.

The very idea of a circular economy has been slowly born over the years, and one cannot point towards a date or an author for it. It has been nurtured by numbers of schools of thought--environmental economics, industrial ecology, and Cradle to Cradle design philosophy. Part of the movement started to go wide in the early 2000s worldwide, especially with the work of a highly regarded global organization, the Ellen MacArthur Foundation, which actually has been established in 2010.

The circular economy is now gaining momentum in India in the recent years. The policies and schemes have started this following the footsteps of the country towards circular economy. The Swachh Bharat Mission, the National Resource Efficiency Policy, and the Atal Innovation Mission are just some examples.

The Organisation for Economic Co-operation and Development (OECD) provides guidelines which lay down principles on the use of EPR. These guidelines describe such ways that are possible for business to undertake. It mentions the advantages and the trade-offs of the ways suggested by it.

Extended Producer Responsibility (EPR) refers to a policy approach wherein the producers bear a significant degree of responsibility, financial and/or physical, for the treatment or disposal of products after they have been consumed. EPR policies extend the responsibility of producers beyond the point of sale and into the post-consumer phase with the aim of encouraging the design of environmentally safe products, alleviating the load on municipal waste management systems, and stimulating sustainable production and consumption patterns. The overarching goal of EPR is to transfer waste disposal responsibility from governments and taxpayers to the producers, thereby encouraging producers to apply sustainable means of production.

This study's importance lies in its evaluation of the effectiveness of EPR policies in favour of circular business models. In times of global climatic changes and resource scarcity, the role EPR plays in speeding up circular practices becomes paramount. The research aims at generating an understanding on whether EPR can be a

catalyst in supporting the transition toward a circular economy through assessing how EPR impinges on waste management, resource efficiency, and sustainability results in varied economic contexts.

## 2. OBJECTIVE

In this research, the objective is to analyse the effectiveness of Extended Producer Responsibility (EPR) policies at encouraging businesses to embrace circularity, with respect to waste management, resource efficiency, and sustainability impacts across the spectrum of economic contexts. The specific research objectives are as follows:

- a. To evaluate the effectiveness of EPR policies in different countries
- b. To analyze how EPR policies compel businesses to adopt circular practices
- c. To investigate the effect of EPR on waste management and resource efficiency
- d. To compare the performance of EPR policy implementation in developed and developing countries

## 3. RESEARCH METHODOLOGY

This research attempts to conduct qualitative research essentially based on secondary sources of data. This approach is one that proposes the systematic collection and analysis and interpretation of data from several credible and authoritative sources to ensure that the research is comprehensive and legitimate.

**Data Collection:** The secondary sources for data collection for this study refer to, and is not limited to the official websites of the government departments and agencies of respective countries, publications and reports from organizations such as OECD, Economic Advisory Council to the Prime Minister (EAC-PM), Ministry of Environment and Forest and Climate Change, Government of India, and Peer-Reviewed/Academic Research Papers.

**Reliability and Validity:** Cross-verification of information from multiple reliable sources will enhance trustworthiness for research.

**Limitation:** The study relies on secondary data and being a qualitative analysis, this study relies widely on subjectivity, but effort will be made to minimize this-to the extent possible-through categorization.

## 4. LITERATURE REVIEW

**(OECD Publishing, Paris, 2024):** According to the paper, at the heart of the EPR framework are the producers; their meaningful participation will help strengthen post-consumer activities of material collection and recovery. The paper has focused on the recognition of the informal waste sector within the EPR. It gives, for example, the provisions of Brazil's National Solid Waste Policy, which considers the contributions of waste pickers. Collaboration and transparency among stakeholders in EPR governance are highly emphasized, as these are critical elements for effective monitoring and evaluation and to ensure a level playing field for products in the market.

**(Compagnoni, 2022):** One of the several findings the research presents in it is the effectiveness of extended producer responsibility (EPR) as a measure for managing electronic waste (e-waste). The research shows that countries and regions differ in the manner in which EPR has been implemented. While some have very effective EPR systems that manage e-waste well, others struggle with compliance and law enforcement challenges. It shows that EPR has positively influenced the increase in e-waste collection rates. The extent to which it has increased is however dependent on factors such as public awareness, available infrastructure and incentives given to consumers and producers. The findings indicate that though EPR can impose costs on producers, it can also provide economic opportunities for the establishment of recycling industries. However, some producers will bear most of the burdens associated with the cost of EPR. The research also indicates that a consumer's participation is necessary for the success of EPR. This paper has studied areas across the globe and throws light on the significant regional differences regarding the efficacy of EPR within a country. For instance, it notes that the European countries usually tend to have comparatively more established EPR frameworks unlike other countries in Asia and Africa, where such systems are less developed or even poorly enforced.

**(Repp et al., 2021):** As employment patterns are expected to undergo changes under a Circular Economy(CE), jobs directly associated with the production of apparel will be reduced if not eliminated, especially in low- to upper-middle-income countries beyond the European Union (EU), like China, Bangladesh, India, Turkey, or Cambodia. Wherever labour-intensive job sectors, which are reckoned to be adversely hit with the transition to CE, are already felt to be slowly reducing, on the other hand, the paper finds that job opportunities would be forged in less labour-intensive activities tied to the reuse and recycling job fields within the boundaries of the

EU. The implementation of Circular Economy will promote second-hand retail activities inside and outside the EU, likely forming yet another spectrum of jobs.

**(Whalen, 2020):** The research states that the Circular Business Models (CBMs), among other things, in addition to working above the ordinary operate with inherent risk for the majority of firms, specifically increasing operational costs associated with reverse logistics, repair and the like. Costs can be huge, especially in areas where labour is expensive. It also found that market demand mattered greatly in the adoption of CBMs. Typically, firms avoided changing operations unless they saw it benefitting customers. This can be of great importance, then, for aligning customer with CBM offerings. Also, the paper points out the strength and weaknesses of Extended Producer Responsibility (EPR) or Extending Product Value (EPV) without making a clear judgment of which is better. For instance, EPR can lead to extra costs for producers in relation to increased product prices, whereas EPV could bring economic benefits to firms because it allows the recovery of value from products that would otherwise have been removed and then into new potential sources of revenue.

**(Hickle, 2016):** The thesis carries out a comparative case analysis of the EPR programs in Minnesota, USA and Ontario, Canada. The paper finds that the Ontario model is much more standardized and collective, allowing for greater engagement and flexibility in the design of programs by industry. By contrast, Minnesota's model emphasizes individual producer responsibility, which can then engender differences and compliance problems. It points out to the governing structure to be a critical aspect in the EPR implementation. Apparently, to many companies, EPR is also an avenue through which they make sustainability efforts; the extent of this connection, however, varies much from firm to firm.

## 5. DISCUSSION AND IMPLICATION

### Legal Framework in India

The laws of EPR are now practically coming under the Plastic Waste Management Rules, 2016. Here, Producers, Importers, and Brand - owners (PIBOs) are held accountable for ensuring the processing of their plastic packaging waste through recycling, re-use, or disposal at the end of life. The amended guidelines were issued by the Ministry of Environment, Forest and Climate Change, Government of India, on February 16, 2022, to aid the EPR implementation process. These guidelines require the PIBOs to register through an online centralized portal created by the Central Pollution Control Board (CPCB) and in some cases with the respective State Pollution Control Boards (SPCBs). Similarly, Plastic Waste Processors (PWP) must register with the concerned SPCB/PCC on this portal.

The EPR Portal for Plastic Packaging thus makes provision under the EPR guidelines to enable PIBOs and PWPs to register. This portal advocates improving accountability, traceability, and transparency in meeting EPR obligations. There are seven modules dealing with the registration and issuance of certificates, credit exchanges, real-time transaction monitoring, environmental compensation, system-generated reports, and filing of annual returns by stakeholders. Currently, three modules are at work.

### Key Differences between Old and New Rules

A scrutiny into the major differences between the Plastic Waste Management Rules of 2016 and the modifications made effective in the year 2024 reveals that the scope of many terms has been increased, or new definitions have been introduced to include more items that can be governed and regulated. Also, there were no specific certification requirements for biodegradable or compostable plastics. However, the rules applicable currently mandate the manufacturer that they obtain a certificate from the Central Pollution Control Board (CPCB) before marketing or selling products made from compostable or biodegradable plastics.

These changes will have the effect of encouraging, and in some way forcing, the businesses to innovate and develop more sustainable packaging solutions. This could prove beneficial to the economy as it may lead to the creation of new products and materials, fostering a more circular economy.

### Comparison to Global Standards

India's proposed alterations to the Plastic Waste Management Rules of 2024 mark a significant stride toward meeting the global benchmarks of plastic waste management. The amendments define and otherwise govern biodegradable plastics: Certification from the CPCB shall be obtained before these plastics can earn the biodegradable label, an approach similar to the stringent EU regulations on compostability standards and US state regulations such as the labelling requirements for biodegradable products of California. India shall also put up definitions and targets for reducing microplastics; the EU proposed a ban on purposely added microplastics for products like cosmetics and detergents, while the US has prohibited the use of microbeads in cosmetics and personal care through the Microbead-Free Waters Act 2015.

EPR is envisioned as being more widely defined by the amendments inclusive of important stakeholders and materials, especially in terms of the EU-approved EPR framework under the Waste Framework Directive and Japan EPR provisions for mandatory recycling of different types of plastic waste. Certification of biodegradable plastics is enforced in India, in parallel to the EU certification of compostable plastics under EN 13432 and US state certification of such plastics. Moreover, the Indian amendments put considerable emphasis on a centralized portal for the registration and monitoring of all plastic waste management activities, akin to EU waste management infrastructure with separate collection systems and recycling facilities and the efficient Japanese waste management system, which subjects households and businesses to stringent sorting and recycling obligations.

Amendments to the Plastic Waste Management Rules, 2024, harmonize the trends in the country with globally accepted best practices around accountability, traceability, and environmental responsibility. Such best practices go in tandem with this growing commitment to the plastic pollution menace and sustainable waste management practices.

### **EPR's Role in Circular Business**

1. Financial incentives for businesses adopting circular practices, such as tax breaks or subsidies for using recycled materials, are part of EPR policies. Penalties for non-compliance, which may include fines or higher waste management fees, push businesses to think through their strategies of production and waste management.
2. EPR policies compel businesses to create products with regard to their entire lifecycle. This means products should be manufactured with the intent of making them easier to recycle, repair, or reuse. "Eco design" gives a scope for reducing the ecological footprint of products and according to circular economy principles as well.
3. The ramifications of EPR change the responsibility for waste management from consumers to producers. It implies that end-of-life management for the product would be the concern of the company, which includes collecting, recycling, and disposing of such products. This will create an incentive for companies to manufacture more sustainable products and packaging.
4. EPR policies promote resource efficiency in firms thereby encouraging them to improve how they use materials so that they are more sustainable. This encompasses mainly using recycled materials, less material by increasing efficiency and further reduction of waste to be generated during the production process. Resource efficiencies create some savings in costs for companies that can be translated into lower environmental costs of performance.
5. The obligation to comply with the EPR policies indeed creates an impetus for innovation in product design and waste management. Development investments help businesses to develop new materials, technologies, and processes that support the new circular practices, which can translate into competitive advantages and new market opportunities.
6. EPR policies frequently demand associations of businesses with other players, like waste management companies, recyclers, and government agencies, for concrete action. It is this coming together that would eventually lead to efficient systems concerning waste management and ultimately engender a culture of sustainability in that particular industry.
7. EPR policies may cause consumer awareness about environmental impacts from products and packaging. More and more, consumers will demand environmentally friendly products as they gain more sustainability awareness and understanding of the resulting environmental impact. This, in turn, pushes businesses to adopt circular practices as conditions within the market demand.

### **Effectiveness in Different Countries**

EPR policies in the EU are well recognized and have served as an important tool in achieving recycling rates and waste reduction. The European Union's Waste Framework Directive makes producers responsible for their products throughout their lifecycles, resulting in heavy investments in recycling infrastructure and innovation in product design. Countries such as Germany and France have been very successful by establishing full-fledged EPR programs with modulated fees to encourage environmentally friendly designs.

EPR policies are practical in Japan, having mandated recycling targets and established a proper waste management structure. Producers are responsible for collection and recycling of several types of plastic waste, resulting in high rates of recycling and effective waste sorting practices. Japan emphasizes collaborative

governance among the three key stakeholders: the government, industry, and consumers, which ensures high levels of compliance and public participation.

In the United States, EPR policies are admittedly more heterogeneous in implementation at the state level rather than by the federal government. Those states having solid EPR programs like California and Oregon have achieved the advancement of recycling rates and waste management practices. Nevertheless, the effectiveness of EPR laws may thus greatly differ from region to region in the absence of a national framework, with some states being almost free of EPR controls.

The effectiveness of EPR measures thus depends on several factors, including the regulatory framework, the manner in which the laws are enforced, and the extent of collaboration among stakeholders. Most environmental benefits are seen in countries with well-designed EPR programs characterized by clear targets, financial incentives, and strong enforcement mechanisms.

### Effect on Waste management and Resource Efficiency

- 1. Waste Management Upgraded:** The EPR policies in the EU changed the parameters of waste management substantially. For instance, the recycling rate for packaging waste in the European Union increased at an unbroken pace from 63% in 2016 to 66% in 2018. This has been credited to the EPR framework which obliges producers to take care of their products at the end of life. Japan's EPR system managed to achieve a very high recycling rate for electric waste. By doing so, Japan managed to achieve a recycling rate for home appliances of 84 % in 2018 due to the Home Appliance Recycling Law based on the EPR principle.
- 2. Resource Efficiency:** The EPR policies in Germany have helped resource efficiency by stressing the use of recycled materials in the waste stream. The recycling rate for municipal waste in Germany was 67% in 2019, one of the highest in the world, which saved considerable natural resources and reduced environmental impacts. With the EPR in the country, resource efficiency in the packaging sector has been improved. The recycling rates for packaging waste in South Korea reached 73% in 2019 on the back of EPR policies that was intended to require incorporation of recycled components into products.
- 3. Economic Effects:** The EPR policies of British Columbia, Canada create a scenario where the recycling sector is turned into a business opportunity. The EPR program for packaging and printed paper in the province has created over 2,000 jobs and around CAD 500 million to the economy each year. The EPR measure for paint recycling in California, the USA has saved local governments more than USD 150 million in disposal costs since it came into being in 2012.
- 4. Environmental Impact:** The EPR policies in EU were in reduction of emissions of greenhouse gases. The recycling of packing wastes in EU saved around 32 million tons of CO<sub>2</sub> equivalent in the year 2018. EPR for e-waste in India has formalized the collection and recycling of more than 200,000 tons of e-waste every year, taking them out of environmental impacts due to improper disposal.

These statistics reveal how dissimilar EPR systems operate across various countries and favourably contribute to waste management and resource efficiency. EPR systems ensure sustainable resource use and open avenues of development by assigning producers responsibility for the lifecycle of their products.

### 6. CONCLUSION

The changes that have been made in the Plastic Waste Management Rules in 2024 reveal an advancement in India's plastic waste management procedures, which in consistence with the global practices. The requirement for certification for biodegradable plastics or those that can be composted added a tough layer of integrity and compliance. These amendments are in full alignment with the strict directives of waste management by the European Union and the collaborative governance model on waste management practice in Japan, overcoming the piecemeal enforcement seen in the United States. Driven by these financial incentives and penalties of non-compliance, promoting resource efficiency covers the latest rules, seeking enhanced performance in recycling rates, eco-design, and sustainability. These EPR rules creates the need to invent and develop bioplastics that degrades easily or that can be reused further can and will push innovation in the industry with increased research and development efforts. This, in turn, would result in the introduction of new materials that are more sustainable towards the environment. Also, such rigorous rules might very well alter the competitive structure of the market with those businesses failing to the embrace of new order or businesses that resist may be outperformed.

The downside is that these rules lead to increased compliance cost for businesses as they need to innovate their process and/or products, and to adapt to the new policies. Apart from the direct cost, the overall administrative expenses and operational cost will increase. The need to get CPCB certification for biodegradable plastics will

require going through some new testing and approval processes, which will take time and may involve a higher cost.

Overall, there should be an improvement in a certain trend in terms of both the environment and the economy by aiding companies in the adoption of innovatively sustainable solutions as well as compelling them to contribute to the more circular economy.

## 7. SUGGESTIONS

The amendments to the PWM rules leave hardly any room for improvement for the time being. However, efforts could be put towards educating the masses and making them aware of such rules by rewarding the companies publicly could increase the positive effects of the rules through increased demand for products made by companies using the circular business models. In order to increase the effectiveness of EPR in promoting circular business models, incentives to consumers may be offered including tax incentives. Also, the remaining four modules on the EPR portal should be made functional at the earliest.

## 8. SCOPE FOR FUTURE RESEARCH

- Further research can be done to identify the effects of EPR on the environment.
- Research may be conducted to gauge the impact of circular business models on the environment.
- The reports prescribed under PWM rules can be studied to identify the lacunas in it.

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